

## XIAOHAN YANG

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<https://scholar.google.com/citations?user=DYH7aqAAAAAJ&hl=en>

### Education and Training

- 2006 – 2008 Oak Ridge National Laboratory (ORNL), Postdoc in *Populus* genomics
- 2005 – 2006 University of Tennessee, Postdoc in *Populus* genomics
- 2002 – 2005 Cornell University, Postdoc in molecular genetics of Arabidopsis
- 2003 Cornell University, Ph.D. Floriculture & Ornamental Horticulture/Plant Molecular Biology/Plant Breeding
- 1989 Huazhong Agricultural University, China M.S., Ornamental Botany
- 1986 Huazhong Agricultural University, China B.Sc., Forest Science

### Research and Professional Experience

- 2017 – present Senior Staff Scientist, Biosciences Division, Oak Ridge National Laboratory
- 2015 – present Faculty Member, Bredesen Center for Interdisciplinary Research and Graduate Education, University of Tennessee, Knoxville
- 2014 – present Joint Faculty, Graduate School of Genome Science and Technology (GST), University of Tennessee, Knoxville
- 2011 – 2016 Staff Scientist, Biosciences Division, Oak Ridge National Laboratory
- 2009 – 2017 Adjunct Faculty, Department of Plant Sciences, University of Tennessee, Knoxville
- 2008 – 2011 Associate Staff Scientist, Biosciences Division, Oak Ridge National Laboratory
- 1989 – 1997 Assistant Research Scientist, Chinese Academy of Agricultural Sciences, Beijing, China.

### Honors and Awards

- 2022 The first prize of Cells 2021 Best Paper Awards for Anniversary Special Issues (<https://www.mdpi.com/journal/cells/awards/1113>)
- 2018 The R&D 100 Award (TNT Cloning System)
- 2008 Distinguished Achievement Award for Post-Graduate Research in Environmental Science (In recognition of outstanding early career productivity, ability to collaborate effectively in a team setting, and ability to integrate bioinformatics and molecular biology to gain novel insights into evolutionary genomics).
- 2000 Liu Memorial Award in recognition of his excellent progress and high potential for a successful academic career.
- 1995 Israeli Foreign Ministry Fellowship for training at the Volcani Center.

## **Other Professional Activities**

### Expert panel

- Research Foundation – Flanders (FWO), a Belgian public research council, based in Brussels (January 1, 2021 - present).

### Proposal review

- US National Science Foundation (NSF) review panel.
- Reviewer for USDA National Research Initiative Competitive Grants Program, Biotechnology and Biological Sciences Research Council (BBSRC), Research Foundation – Flanders (FWO), and USDA Internal Project.

### Manuscript review

- Reviewer for ACS Synthetic Biology, Biotechnology Progress, BMC Bioinformatics, BMC Biotechnology, Critical Reviews in Plant Sciences, Environmental Management, International Journal of Plant Genomics, Journal of Experimental Botany, Journal of Plant Biotechnology, Journal of Proteomic Research, Nature Biotechnology, Nature Plants, New Phytologist, Physiologia Plantarum, Planta, Plant Methods, Plos Computational Biology

### Membership

- Member of American Association for the Advancement of Science (2018 - present)

### Service

- Editor-in-Chief of BioDesign Research (<https://spi.sciencemag.org/bdr/>) (2019 - present)
- Joint convener of the 1<sup>st</sup> International BioDesign Research Conference (<https://www.biodesign-conference.com/2020/>)
- Joint convener of 2<sup>nd</sup> International BioDesign Research Conference (<https://www.biodesign-conference.com/2021/>)
- Joint convener of the 3rd International BioDesign Research Conference (<https://www.confexiv.com/IBDRC2022/>)
- Co-organizer of the “Genome Biodesign in Plants and Animals” session at the Plant & Animal Genome Conference: PAG 30 (<https://www.intlpag.org/30/>)
- Organizer of the 34th New Phytologist Symposium: Systems biology and ecology of CAM plants. Tahoe City, CA, USA, 15–18 July 2014. (<http://www.newphytologist.org/symposiums/view/5>)
- Editorial Board of Scientific Reports (2018 - 2021)
- Editorial Board of Plants (2019 - present)
- Editorial Board of aBIOTECH (2022 - present)
- Lead guest editor for Special Issue "Genetics, genomics, and evolution of CAM photosynthesis" in Genes. [http://www.mdpi.com/journal/genes/special\\_issues/cam\\_photosynth](http://www.mdpi.com/journal/genes/special_issues/cam_photosynth)
- Lead guest editor for Research Topic entitled “Systems Biology and Synthetic Biology in Relation to Drought Tolerance or Avoidance in Plants” in Frontiers in Plant Science. <http://journal.frontiersin.org/researchtopic/6651/systems-biology-and-synthetic-biology-in-relation-to-drought-tolerance-or-avoidance-in-plants>
- Lead guest editor for a special issue entitled “Plant Comparative and Functional Genomics”. International Journal of Genomics. <http://www.hindawi.com/journals/ijg/si/825361/>
- Leader of the ORNL CAM research team, a key component of the \$14.3 million multi-institutional DOE project to engineer crassulacean acid metabolism (CAM) into C<sub>3</sub> plants to enhance water-use efficiency for sustainable biofuels production on marginal land.

## Media Coverage

“Does Agave Hold the Secret to Drought-Resistant Farming?” (July 13, 2015)

<http://www.scientificamerican.com/article/does-agave-hold-the-secret-to-drought-resistant-farming/>

“Can genetic engineering help quench crops’ thirst?” (January 4, 2016)

<http://ensia.com/features/can-genetic-engineering-help-quench-crops-thirst/>

“New study of water-saving plants advances efforts to develop drought-resistant crops” (December 5, 2016)

<https://www.ornl.gov/news/new-study-water-saving-plants-advances-efforts-develop-drought-resistant-crops>

“Small Proteins Secreted by Poplar Roots Form Communication Route with Associated Fungal Communities” (May 10, 2017)

<http://genomicscience.energy.gov/program/berhighlights.shtml>

“SimPath licenses novel ORNL system for enhanced synthetic biology” (October 16, 2017)

<https://www.ornl.gov/news/simpath-licenses-novel-ornl-system-enhanced-synthetic-biology>

“Genes found in drought-resistant plants could accelerate evolution of water-use efficient crops” (December 1, 2017)

<https://www.ornl.gov/news/genes-found-drought-resistant-plants-could-accelerate-evolution-water-use-efficient-crops>

“Researchers Discover Genes That Make Plants Drought-Resistant” (June 21, 2018)

<https://www.rdmag.com/article/2018/06/researchers-discover-genes-make-plants-drought-resistant>

<https://www.rdmag.com/article/2018/07/r-d-special-focus-plant-science>

“Genome Insider Episode 8: A Plantiful Future” (October 13, 2020)

<https://jgi.doe.gov/genome-insider-episode-8-plantiful-future-xiaohan-yang-ornl/>

“Single gene boosts climate resilience, yield and carbon capture in crops” (June 3, 2021)

<https://www.ornl.gov/news/single-gene-boosts-climate-resilience-yield-and-carbon-capture-crops>

“Watching Plants Switch on Genes” (October 7, 2022)

<https://www.energy.gov/science/ber/articles/watching-plants-switch-genes>

“Agave gene delays poplar dormancy” (January 17, 2023)

<https://www.ornl.gov/news/agave-gene-delays-poplar-dormancy>

## Invention

### Patent

- US Patent No.: 10,017,770 B2 (Issued: July 10, 2018) “TNT Cloning System”. Inventors: Tuskan GA, Yang X, De Paoli HC.
- U.S. patent No. US 10,227,601 B2 (Issued: March 12, 2019): “PtDUF266 Gene Regulating Cell Wall Biosynthesis and Recalcitrance in *Populus*”. Inventors: Jin-Gui Chen, Sara Jawdy, Xiaohan Yang, Gerald A. Tuskan, Yongil Yang, Lee E. Gunter

- U.S. patent No. US 10,246,719 B2 (Issued: April 2, 2019): “Modulating Laccase Enzyme to Regulate Cell Wall Biosynthesis and Recalcitrance in Plants”. Inventors: Jin-Gui Chen, Lee E. Gunter, Sara S. Jawdy, Xiaohan Yang, Gerald A. Tuskan, Anthony C. Bryan
- U.S. patent No. US 11,028,404 B2 (Issued: June 8, 2021): “Methods of improving mycorrhization in plants and genetically modified plants with improved mycorrhization”. Inventors: Wellington Muchero, Jessy L Labbe, Lee E Gunter, Jin-Gui Chen, Sara S Jawdy, Xiaohan Yang, Gerald A Tuskan, Juan Wang, Olaf Czarnecki, Priya Ranjan
- U.S. patent No. US 11,041,164 B2 (Issued: June 22, 2021): “Genes for enhancing drought and heat tolerance in plants and methods of use”. Inventors: Xiaohan Yang, Gerald A. Tuskan, Degao Liu, Rongbin Hu, Jin-Gui Chen, Meng Xie
- U.S. patent No. US 11,535,860 B2 (Issued: December 27, 2022) “Genes for enhancing salt and drought tolerance in plants and methods of use”. Inventors: Xiaohan Yang, Degao Liu, Rongbin Hu, Gerald A. Tusksn.

#### Pending patent

- Kalluri UC, Nycz A, Love LJ, Paquit VC, Yang X, Leach SC, Walters H. “Method and system for automated plant surveillance and manipulation” US Patent App. 17/237,503 (Filed date: April 22, 2021)
- Yang X, Yuan G, Lu H, Hassan MD, Tuskan GA. “Reporter genes confer new-to-nature ornamental traits in plants” US Provisional Application No. 63/318,939 (Filed date: March 11, 2022)
- Yang X, Liu D, Li Y, Tuskan GA “Year-Round Plant Growth in Warm Conditions” US Provisional Patent App. 63/331,899 (Filed date: April 18, 2022).
- Yang X, Yuan G, Martin S, Hassan MD, Tuskan GA. “Rapid Assembly of gRNA Arrays” US Provisional Application No. 63/345,460 (Filed date: May 25, 2022)
- Yang X, Yuan G, Lu H, Hassan MD, Tuskan GA. “Split Selectable Marker Mediated Gene Stacking” US Provisional Application No. 63/408,485 (Filed date: September 21, 2022)

#### Invention disclosures

- Invention Disclosure 201403422, DOE S-138,049, “A PtDUF231 Gene Regulating Cell Wall Biosynthesis and Recalcitrance in *Populus*”. (elected for patent application)
- Invention Disclosure 201403416 DOE S-138,043, “A Laccase Enzyme Regulating Cell Wall Biosynthesis and Recalcitrance in *Populus*”.
- Invention Disclosure 201403419, DOE S-138,046, “PtCAD2359 Knockdown Affects the Lignin Biosynthetic Pathway in *Populus*”.
- Invention Disclosure 201403421, DOE S-138,048, “A PtVND6 Gene Regulating Cell Wall Biosynthesis and Recalcitrance in *Populus*.”
- Invention Disclosure 201403424, DOE S-138,051, “A Prolyl 4-Hydroxylase Alpha Subunit Enzyme Regulates Cell Wall Biosynthesis and Recalcitrance in *Populus*”.
- Invention Disclosure 201403434, DOE S-138,061, “A Serine Hydroxymethyltransferase Regulates Cell Wall Biosynthesis and Recalcitrance in *Populus*”.
- Invention Disclosure 201403435, DOE S-138,062, “A Prefoldin-Like Protein Regulates Cell Wall Biosynthesis and Recalcitrance in *Populus*”.
- Invention disclosure 201804142 “Gene for enhancing photosynthetic performance and biomass production in plants”

#### **Invited Talk**

- “Genomics of CAM plants: *Kalanchoe* gene atlas and the genomes of *Kalanchoe* and *Agave*”. Plant & Animal Genome Conference: PAG 30 (Session: BER Plant Genomic Science); January 13-18, 2023, San Diego, CA

- “System-level design of plant carbon pump for carbon dioxide removal and utilization on marginal lands”. DOE ARPA-E Carbon Farming Workshop, Kansas City, Missouri; June 29, 2022.
- “How can crassulacean acid metabolism contribute to climate change mitigation?”. The Center for Precision Plant Genomics, University of Minnesota; April 22, 2022.
- “CAM genomics and plant synthetic biology for bioenergy and ecosystem security”. Plant Biology Department, University of Illinois Urbana-Champaign; January 19, 2022.
- “Perspectives on the application of plant synthetic biology in climate change mitigation” at the 2nd International BioDesign Research Conference. (<https://www.biodesign-conference.com/2021>) December 16, 2021.
- “The potential of engineering a ‘Super Plant Carbon Pump’ for carbon dioxide removal”. Climate Change & Ag Innovation Conference, Boston; November 11, 2021.
- “Challenges and opportunities in the application of biosystems design in plants” at the 1st International BioDesign Research Conference. (<https://www.biodesign-conference.com/2020>) December 16, 2020.
- “Biosystems design: the future promise of plant science” at the 7th International Horticulture Research Conference (<http://www.hortres-conference.org/>). July 1, 2020. (Plenary talk)
- “Comparative genomics analysis of drought response between CAM and C<sub>3</sub> photosynthesis plants” International Plant & Animal Genome XXVIII; January 11- 15, 2020, San Diego, CA
- “Can Poplar Plants Use Mobile Protein Signals to Influence Mycorrhizal Fungi?” International Plant & Animal Genome XXVIII; January 11- 15, 2020, San Diego, CA
- “Application of Genome-Editing in Crassulacean Acid Metabolism (CAM) Plants” aBIOTECH board meeting and the First aBIOTECH International Conference. June 13 – 14, 2019. Beijing, China
- “Expanding the Capabilities for Plant Genome-Editing and Synthetic Biology”. International Plant & Animal Genome XXVII; January 12-16, 2019, San Diego, CA
- “Plant Systems Biology and Biotechnology in Relation to Crassulacean Acid Metabolism”. October 18, 2018, Morgan State University in Baltimore, Maryland
- “Implementation of drought avoidance mechanisms for sustainable crop production”. July 20-24, 2018. The Fifth International Horticulture Research Conference. Beijing, China.
- “An integrative approach to understanding the function of crassulacean acid metabolism (CAM)-related genes in *Agave* and *Kalanchoe*”. April 9-13, 2018. An international symposium entitled “Biology of CAM Plants”. Phoenix, Arizona, USA
- “Unravelling the Molecular Basis of Plant Water-use Efficiency and Plant-microbe Symbiosis”. February 16, 2018. Clemson University.
- “Molecular signatures of crassulacean acid metabolism”. July 23-29, 2017. The XIX International Botanical Congress (IBC2017). Shenzhen, China.
- “Toolbox for plant synthetic biology”. February 16-17, 2017. BBSRC-funded Global Challenges Research Fund (GCRF) Workshop titled “Exploring synthetic biology for enhanced plant production”, University of Liverpool, UK
- “Systems Biology and Synthetic Biology of Crassulacean Acid Metabolism”. April 13, 2016. BCMB 615 Seminar Series, University of Tennessee, Knoxville, TN
- “Comparative Evolution of Crassulacean Acid Metabolism (CAM)”. The Plant and Animal Genome Conference; January 2016 in San Diego, CA.
- “Discovery of effector-like proteins in *Populus* during symbiosis formation”. IUFRO Tree Biotechnology Conference. 8-12 June 2015, Florence, Italy.

- “Genome-wide discovery of non-coding RNAs in willow (*Salix purpurea*)”. The Plant and Animal Genome Conference XXIII. 10-14 January 2015, San Diego, CA, USA.
- “Comparative genomics of CAM plants” The 34th New Phytologist Symposium: Systems biology and ecology of CAM plants; Tahoe City, CA, USA 15–18 July 2014
- “Comparative genomics of CAM species” The Plant and Animal Genome XXII Conference; January 11-15, 2014 in San Diego, CA
- “*Agave* genomics in support of CAM engineering”. International Symposium on C<sub>4</sub> and CAM Plant Biology (August 6-9, 2013, Champaign, IL).

**Publications** (A total of 131; “\*” indicates corresponding author)

131. Y. Liu, G. Yuan, B. Hyden, G. A. Tuskan, P. E. Abraham\*, **X. Yang\***, Expanding the application of anti-CRISPR proteins in plants for tunable genome editing. *Plant Physiology* (**accepted**), (2023). doi:
130. G. Yuan, S. Martin, M. M. Hassan, G. A. Tuskan\*, **X. Yang\***, PARA: A new platform for the rapid assembly of gRNA arrays for multiplexed CRISPR technologies. *Cells* **11**, 2467 (2022). doi: 10.3390/cells11162467
129. G. Yuan, H. Lu, D. J. Weston, S. Jawdy, T. J. Tschaplinski, G. A. Tuskan\*, **X. Yang\***, Reporter genes confer new-to-nature ornamental traits in plants. *Horticulture Research* **9**, uhac077 (2022). doi: 10.1093/hr/uhac077
128. G. Yuan, H. Lu, K. De, M. M. Hassan, Y. Liu, Y. Li, W. Muchero, P. E. Abraham, G. A. Tuskan\*, **X. Yang\***, An Intein-Mediated Split-nCas9 System for Base Editing in Plants. *ACS Synthetic Biology* **11**, 2513-2517 (2022). doi: 10.1021/acssynbio.1c00507
127. S. Tan, Y. Liang, Y. Huang, J. Xi, X. Huang\*, **X. Yang\***, K. Yi\*, Phylogeny and expression atlas of the NITRATE TRANSPORTER 1/PEPTIDE TRANSPORTER FAMILY in *Agave*. *Plants* **11**, 1434 (2022). doi: 10.3390/plants11111434
126. R. S. Payyavula, R. Badmi, S. S. Jawdy, M. Rodriguez Jr, L. Gunter, R. W. Sykes, K. A. Winkeler, C. M. Collins, W. H. Rottmann, J.-G. Chen, **X. Yang**, G. A. Tuskan, U. C. Kalluri\*, Biomass formation and sugar release efficiency of *Populus* modified by altered expression of a NAC transcription factor. *Plant Direct* **6**, e419 (2022). doi: 10.1002/pld3.419
125. Y. Liu, G. Yuan, M. M. Hassan, P. E. Abraham, J. C. Mitchell, D. Jacobson, G. A. Tuskan, A. Khakhar, J. Medford, C. Zhao, C.-J. Liu, C. A. Eckert, M. J. Doktycz, T. J. Tschaplinski, **X. Yang\***, Biological and molecular components for genetically engineering biosensors in plants. *BioDesign Research* **2022**, 9863496 (2022). doi: 10.34133/2022/9863496
124. D. Liu, D. Tang, M. Xie, J. Zhang, L. Zhai, J. Mao, C. Luo, A. Lipzen, Y. Zhang, E. Savage, G. Yuan, H.-B. Guo, D. Tadesse, R. Hu, S. Jawdy, H. Cheng, L. Li, H. Yer, M. M. Clark, H. Sun, J. Shi, R. Budhathoki, R. Kumar, T. Kamuda, Y. Li, C. Pennacchio, K. Barry, J. Schmutz, R. Berry, W. Muchero, J.-G. Chen, Y. Li, G. A. Tuskan, **X. Yang\***, *Agave REVEILLE1* regulates the onset and release of seasonal dormancy in *Populus*. *Plant Physiology*, kiac588 (2022). doi: 10.1093/plphys/kiac588
123. B. Hyden, G. Yuan, Y. Liu, L. B. Smart, G. A. Tuskan, **X. Yang\***, Protoplast-based transient expression and gene editing in shrub willow (*Salix purpurea* L.). *Plants* **11**, 3490 (2022). doi:
122. X. Huang, B. Xu, S. Tan, Y. Huang, J. Xi, X. Qin, T. Chen, H. Chen, **X. Yang\***, K. Yi\*, Transcriptome sequencing of *Agave angustifolia* reveals conservation and diversification in the expression of cinnamyl alcohol dehydrogenase genes in *Agave* species. *Agriculture* **12**, 1003 (2022). doi: 10.3390/agriculture12071003
121. X.-L. Hu, J. Zhang, R. Kaundal, R. Kataria, J. L. Labbé, J. C. Mitchell, T. J. Tschaplinski, G. A. Tuskan, Z.-M. Cheng\*, **X. Yang\***, Diversity and conservation of

- plant small secreted proteins associated with arbuscular mycorrhizal symbiosis. *Horticulture Research* **9**, uhac043 (2022). doi: 10.1093/hr/uhac043
120. R. Hu, J. Zhang, S. Jawdy, A. Sreedasyam, A. Lipzen, M. Wang, V. Ng, C. Daum, K. Keymanesh, D. Liu, H. Lu, P. Ranjan, J.-G. Chen, W. Muchero, T. J. Tschaplinski, G. A. Tuskan, J. Schmutz, **X. Yang\***, Comparative genomics analysis of drought response between obligate CAM and C<sub>3</sub> photosynthesis plants. *Journal of Plant Physiology* **277**, 153791 (2022). doi: 10.1016/j.jplph.2022.153791
  119. M. M. Hassan, G. Yuan, Y. Liu, M. Alam, C. A. Eckert, G. A. Tuskan, J. F. Golz\*, **X. Yang\***, Precision genome editing in plants using gene targeting and prime editing: existing and emerging strategies. *Biotechnology Journal* **17**, e2100673 (2022). doi: 10.1002/biot.202100673
  118. M. M. Hassan, S. Martin, K. Feng, T. B. Yates, G. Yuan, M. Z. Martin, S. Martin, W. Muchero, N. A. Griffiths, D. Weston\*, **X. Yang\***, Genome-wide identification and functional prediction of silicon (Si) transporters in poplar (*Populus trichocarpa*). *Plant Biotechnology Reports*, (2022). doi: 10.1007/s11816-022-00788-4
  117. G. Chai, M. Lu, **X. Yang**, T. Demura, W. Li, Q. Li, Editorial: Wood Development and Physiology in a Changing Climate. *Frontiers in Plant Science* **13**, 906736 (2022). doi: 10.3389/fpls.2022.906736
  116. G. Yuan, H. Lu, D. Tang, M. M. Hassan, Y. Li, J.-G. Chen, G. A. Tuskan\*, **X. Yang\***, Expanding the application of a UV-visible reporter for transient gene expression and stable transformation in plants. *Horticulture Research* **8**, 234 (2021). doi: 10.1038/s41438-021-00663-3
  115. G. Yuan, M. M. Hassan, T. Yao, H. Lu, M. M. Vergara, J. L. Labbé, W. Muchero, C. Pan, J.-G. Chen, G. A. Tuskan, Y. Qi, P. E. Abraham\*, **X. Yang\***, Plant-based biosensors for detecting CRISPR-mediated genome engineering. *ACS Synthetic Biology* **10**, 3600-3603 (2021). doi: 10.1021/acssynbio.1c00455
  114. **X. Yang\***, D. Liu, H. Lu, D. J. Weston, J.-G. Chen, W. Muchero, S. Martin, Y. Liu, M. M. Hassan, G. Yuan, U. C. Kalluri, T. J. Tschaplinski, J. C. Mitchell, S. D. Wullschleger, G. A. Tuskan, Biological parts for plant biodesign to enhance land-based carbon dioxide removal. *BioDesign Research* **2021**, 9798714 (2021). doi: 10.34133/2021/9798714
  113. F. Tian, X.-L. Hu, T. Yao, **X. Yang**, J.-G. Chen, M.-Z. Lu, J. Zhang\*, Recent advances in the roles of HSFs and HSPs in heat stress response in woody plants. *Frontiers in Plant Science* **12**, 1319 (2021). doi: 10.3389/fpls.2021.704905
  112. H. K. Shrestha, M. I. V. Solis, S. S. Jawdy, G. A. Tuskan, **X. Yang**, P. E. Abraham\*, Temporal dynamics of protein and post-translational modification abundances in *Populus* leaf across a diurnal period. *Proteomics* **21**, 2100127 (2021). doi: 10.1002/pmic.202100127
  111. R. C. Moseley, F. Motta, G. A. Tuskan, S. B. Haase, **X. Yang\***, Inference of gene regulatory network uncovers the linkage between circadian clock and crassulacean acid metabolism in *Kalanchoë fedtschenkoi*. *Cells* **10**, 2217 (2021). doi: 10.3390/cells10092217
  110. D. Liu, R. Hu, J. Zhang, H.-B. Guo, H. Cheng, L. Li, A. M. Borland, H. Qin, J.-G. Chen, W. Muchero, G. A. Tuskan, **X. Yang\***, Overexpression of an *Agave* phosphoenolpyruvate carboxylase improves plant growth and stress tolerance. *Cells* **10**, 582 (2021). doi: 10.3390/cells10030582
  109. Z. Hu, Z. Nie, C. Yan, H. Huang, X. Ma, Y. Wang, N. Ye, G. A. Tuskan, **X. Yang**, H. Yin\*, Transcriptome and degradome profiling reveals a role of miR530 in the circadian regulation of gene expression in *Kalanchoë marnieriana*. *Cells* **10**, 1526 (2021). doi: 10.3390/cells10061526
  108. X.-L. Hu, H. Lu, M. M. Hassan, J. Zhang, G. Yuan, P. E. Abraham, H. K. Shrestha, M. I. Villalobos Solis, J.-G. Chen, T. J. Tschaplinski, M. J. Doktycz, G. A. Tuskan, Z.-M.

- Cheng\*, **X. Yang\***, Advances and perspectives in discovery and functional analysis of small secreted proteins in plants. *Horticulture Research* **8**, 130 (2021). doi: 10.1038/s41438-021-00570-7
107. M. M. Hassan, Y. Zhang, G. Yuan, K. De, J.-G. Chen, W. Muchero, G. A. Tuskan, Y. Qi\*, **X. Yang\***, Construct design for CRISPR/Cas-based genome editing in plants. *Trends in Plant Science* **26**, 1133-1152 (2021). doi: 10.1016/j.tplants.2021.06.015
106. J. Zhang, M. Xie, M. Li, J. Ding, Y. Pu, A. C. Bryan, W. Rottmann, K. A. Winkeler, C. M. Collins, V. Singan, E. A. Lindquist, S. S. Jawdy, L. E. Gunter, N. L. Engle, **X. Yang**, K. Barry, T. J. Tschaplinski, J. Schmutz, G. A. Tuskan, W. Muchero\*, J.-G. Chen\*, Overexpression of a Prefoldin  $\beta$  subunit gene reduces biomass recalcitrance in the bioenergy crop *Populus*. *Plant Biotechnology Journal* **18**, 859-871 (2020). doi: 10.1111/pbi.13254
105. J. Zhang, R. Hu, A. Sreedasyam, T. M. Garcia, A. Lipzen, M. Wang, P. Yerramsetty, D. Liu, V. Ng, J. Schmutz, J. C. Cushman, A. M. Borland, A. Pasha, N. J. Provart, J.-G. Chen, W. Muchero, G. A. Tuskan, **X. Yang\***, Light-responsive expression atlas reveals the effects of light quality and intensity in *Kalanchoë fedtschenkoi*, a plant with crassulacean acid metabolism. *GigaScience* **9**, giaa018 (2020). doi: 10.1093/gigascience/giaa018
104. G. Yuan, M. M. Hassan, D. Liu, S. D. Lim, W. C. Yim, J. C. Cushman, K. Markel, P. M. Shih, H. Lu, D. J. Weston, J.-G. Chen, T. J. Tschaplinski, G. A. Tuskan, **X. Yang\***, Biosystems design to accelerate C<sub>3</sub>-to-CAM progression. *BioDesign Research* **2020**, 3686791 (2020). doi: 10.34133/2020/3686791
103. **X. Yang\***, J. I. Medford, K. Markel, P. M. Shih, H. C. De Paoli, C. T. Trinh, A. J. McCormick, R. Ployet, S. G. Hussey, A. A. Myburg, P. E. Jensen, M. M. Hassan, J. Zhang, W. Muchero, U. C. Kalluri, H. Yin, R. Zhuo, P. E. Abraham, J.-G. Chen, D. J. Weston, Y. Yang, D. Liu, Y. Li, J. Labbe, B. Yang, J. H. Lee, R. W. Cottingham, S. Martin, M. Lu, T. J. Tschaplinski, G. Yuan, H. Lu, P. Ranjan, J. C. Mitchell, S. D. Wullschleger, G. A. Tuskan, Plant biosystems design research roadmap 1.0. *BioDesign Research* **2020**, 8051764 (2020). doi: 10.34133/2020/8051764
102. **X. Yang\***, J. C. Cushman, A. M. Borland, Q. Liu, Editorial: Systems biology and synthetic biology in relation to drought tolerance or avoidance in plants. *Frontiers in Plant Science* **11**, 394 (2020). doi: 10.3389/fpls.2020.00394
101. H. Lu, G. Yuan, S. H. Strauss, T. J. Tschaplinski, G. A. Tuskan, J.-G. Chen\*, **X. Yang\***, Reconfiguring plant metabolism for biodegradable plastic production. *BioDesign Research* **2020**, 9078303 (2020). doi: 10.34133/2020/9078303
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